PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-218150
(43)Date of publication of application : 27.08.1993

(51)Int.Cl. H01L 21/66
G01R 1/073
G01R 31/26

(21)Application number : 04-308928
(22)Date of filing : 18.11.1992

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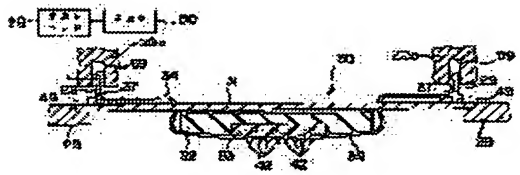
(30)Priority
Priority number : 03301961 Priority date : 18.11.1991 Priority country : JP

(54) PROBE CARD

(57)Abstract:
PURPOSE: To provide a probe card used for a probing test machine for inspecting the electric characteristics of a semiconductor chip circuit or LCD board circuit.
CONSTITUTION: The title probe card is one used for a probing test machine which transmits or receives test signals from a circuit through the pads of a semiconductor chip and inspects the electric characteristics of the circuit. The probe card has a support plate 31, a flexible printed circuit board containing a flexible film base material supported by this support plate and having a circuit printed on this film base material and connected to a tester electrically, contactors 42 connected electrically to the printed circuit and brought into contact with the pads one to one, and cushion materials 33 provided to back up sections where the contactors are fitted. When the contactors are brought into contact with the pads, the cushion materials deform elastically, and the contact between the contactors and the pads becomes better.



LEGAL STATUS

[Date of request for examination]	12.11.1997
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	2966671
[Date of registration]	13.08.1999
[Number of appeal against examiner's decision of	

rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

CLAIMS

[Claim(s)]

[Claim 1] In the probe card used for the probing test machine which exchanges a test signal with a circuit through the pad of analyte, and inspects the electrical characteristics of a circuit A support plate and the circuit board with the circuit which was supported by this support plate and was electrically connected with the test signal supply means, The contactor which it connects with the circuit of this circuit board electrically, and is contacted by 1 to 1 to the pad of analyte, The probe card which will be characterized by said elastic body member carrying out elastic deformation if it has the elastic body member prepared so that the field in which said contactor was attached might be backed up and said contactor and pad are contacted.

[Claim 2] In the probe card used for the probing test machine which exchanges a test signal with a circuit through the pad of analyte, and inspects the electrical characteristics of a circuit A support plate and the flexible printed circuit substrate by which the circuit printed on this film base material is electrically connected with the test signal supply means including the flexible film base material supported by this support plate, The contactor which it connects with the circuit of this flexible printed circuit substrate electrically, and is contacted by 1 to 1 to the pad of analyte, The probe card which will be characterized by said elastic body member carrying out elastic deformation if it has the elastic body member prepared so that the section in which said contactor was attached might be backed up and said contactor and pad are contacted.

[Claim 3] In the probe card used for the probing test machine which exchanges a test signal with a circuit through the pad of analyte, and inspects the electrical characteristics of a circuit A support plate and a transparent-body substrate with the circuit which was supported by this support plate and was electrically connected with the test signal supply means, The contactor which it connects with the circuit of this transparent-body substrate electrically, and is contacted by 1 to 1 to the pad of analyte, The probe card which will be characterized by said elastic body member carrying out elastic deformation if it has the elastic body member prepared so that the field in which said contactor was attached might be backed up and said contactor and pad are contacted.

[Claim 4] Said contactor is a probe card given in claim 1 characterized by having the projection of an elastic body, and the metal ball laid underground into this projection thru/or any 1 term of 3.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the probe card used in order to carry out the energization test of a semiconductor chip circuit or the LCD circuit.
[0002]
[Description of the Prior Art] In the production process of a semiconductor device, or the production process of a LCD glass substrate (henceforth a LCD substrate), in order to investigate an open circuit, electrical characteristics, etc. of a circuit, the probing test is performed. For example, a probing test machine (henceforth a prober) is used for the probing test of a semiconductor chip circuit. The prober has loading / unloading section, and the test section. The PURIARAIMENTO stage is established in loading / unloading section. The probe card is prepared in the test section at the wafer stage and the list.
[0003] As shown in drawing 21 , many products made from a tungsten or the probe needle 7 made from the alloy of gold and copper is attached in the conventional probe card 6. A probe card 6 is fixed to the frame of a prober, and the wafer table 5 attached directly under this on the wafer stage is located.
[0004] As shown in drawing 22 , using optical-system location detection equipment like a microscope 8 or a CCD camera (not shown), a chip 3 is removed through opening 6a of a probe card, and alignment of the pad 4 is carried out at the tip of the probe needle 7. This alignment actuation is called teaching. Based on teaching, the wafer table 5 is moved in the direction of X-Y-Z-theta, respectively, and as shown in drawing 23 , each pad 4 is contacted at the tip of each probe needle 7, respectively. And it energizes in a circuit through the probe needle 7, and the signal which returns from a circuit is sent to a circuit tester. In a circuit tester, the good of IC chip and a defect are judged based on a test signal.
[0005]
[Problem(s) to be Solved by the Invention] Recently, a semiconductor device tends to be integrated highly with 16 megabits and 64 megabits, and the number of the pads 4 prepared in 1 chip in connection with this also amounts to hundreds of pieces. With this, a pad 4 and a pad 4 approach mutually, and a mutual pitch distance of a pad train is very small. For example, one side is 60 micrometers - 100 micrometer angle, and a mutual pitch distance of a pad train of each pad 4 is 100 micrometers - 200 micrometers. Therefore, the number of the probe needles 7 which should be attached in a probe card 6 must be sharply increased with hundreds of, and the layout design of the probe needle 7 is becoming very difficult.
[0006] Furthermore, in a gate array which was formed into the compound chip, combining the large-scale integrated circuit and standard cell like VLSI and ULSI two or more, a pad 4 exists not only in the periphery field of a chip 3 but in the central field of a chip 3. It is becoming impossible for this reason, to test VLSI, ULSI, and compound chip-ized IC using the probe card 6 of a type conventionally. Although the train of the probe needle 7 is arranged so that it may be contacted to the pad 4 of a chip periphery field, it is because it is not arranged so that it may be made to contact to pad 4a of a chip central field.
[0007] Moreover, in order to gather test effectiveness and to enable it to test two or more chips, for example, 8-16 chips, to coincidence, it cannot respond in the probe card of the conventional type which forms the probe needle 7 only on the outskirts.
[0008] In order to carry out the probing test of such a VLSI etc., the probe card which arranged the probe needle in piles to the duplex is in an insulating substrate from the former. However, in order for hundreds of to have to attach in a substrate the probe needle with which, as for a multiplex needle type probe card, the diameter at a tip is set to about 60 micrometers, it is difficult to adjust the anchoring precision, and precision is coming to near the limitation. Moreover, in order to manufacture such a multiplex needle type probe card by handicraft, it is high cost.
[0009] By the way, it is necessary to ensure electric contact to the pad of a semiconductor chip, or the pad of a LCD substrate. for example, the overdrive of the wafer stage 5 is carried out to a Z direction -- making -- the tip of the probe needle 7 -- the natural oxidation film on the top face of a pad -- breaking through -- to some extent -- ****** -- the pad 4 is pushed against the probe needle 7 like. However, in large-sized chips, such as VLSI and ULSI, dispersion in height (irregularity) cannot become large between pads, and it cannot respond with the conventional metal probe needle to the irregularity of such a pad train. That is, on the other hand to a high

pad, a probe needle serves as contact with an inadequate probe needle to past [penetrating] and a low pad deeply (a poor contact is started). For this reason, there is a trouble that a positive probing test cannot be carried out, in the conventional probe card.
[0010] Furthermore, according to the conventional probe card, the probing test only of the one chip per time can be carried out. For this reason, when testing a wafer which has the 100 or more numbers of chips, a test takes long duration.
[0011] On the other hand, since a LCD substrate is larger than a semiconductor chip, in the conventional probe card, one LCD substrate cannot be inspected at once, but it is inspecting in several steps, moving a probe card. In this case, since alignment of the pad on a LCD substrate and a probe needle must be performed for every inspection, inspection of one LCD substrate has taken the long time. Especially the LCD substrate being enlarged and carrying out the probing test of the LCD substrate of large size like 450mm angle recently, has taken very long time amount. For this reason, the probe card of the low cost which has the contactor which can be stabilized in all the pads of a LCD substrate and can be uniformly contacted during a test is demanded.
[0012] The purpose of this invention is to offer the probe card which can maintain contact at stability to pads, such as a LCD substrate, at a VLSI chip, ULSI, compound chip-ized IC, and a list. Moreover, alignment actuation with a probe needle (contactor) and a pad is easy, reaches far and wide, makes many pads carry out package contact, and is to offer the probe card which can be tested in a short time. Furthermore, offering an easy probe card has manufacture and maintenance.
[0013]
[Means for Solving the Problem] It is supported by the support plate and this support plate, and connects with the circuit of the circuit board with the circuit electrically connected to the test signal supply means, and this circuit board electrically, and the probe card concerning this invention has the contactor contacted by 1 to 1 to the pad of analyte, and the elastic body member prepared so that the field in which said contactor was attached might be backed up.
[0014] Furthermore, as for a contactor, it is desirable to have the projection of an elastic body and the metal ball laid underground into this projection. Silicone rubber, fluororesin, polyethylene, etc. can be used for the projection of an elastic body. Moreover, it is desirable to use for a metal ball what plated gold, silver, etc. to the nickel ball or the iron ball.
[0015] Moreover, in order to realize high-speed tests, such as VLSI or ULSI, it is desirable to consider as the continuous thing without middle connection of the circuit from a contactor contact to a POGO pin contact, and to make a circuit into low impedance. Moreover, it is desirable to form in a support plate the through tube which can see the pad or alignment mark on analyte.
[0016] Moreover, a contactor can be prepared until it reaches not only the periphery section of the field which should be tested but its center section. It enables a pad to carry out probe inspection of the devices, such as IC prepared also in the chip central field, by this.
[0017]
[Function] In the probe card concerning this invention, if a pad is contacted to a contactor, an elastic body member will carry out elastic deformation, both will fit, and contact will become good. Even if it is the case where there is irregularity of height between pads especially, each contactor follows the contact schedule side of a pad, respectively, and all contactors fully come to contact to a pad.
[0018]
[Example] Hereafter, the various examples of this invention are explained with reference to an attached drawing.
[0019] As shown in drawing 1 , a prober 10 has loading / unloading section 11, and the test section 21. The test head 28 and upper CCD camera 25 are formed above the test section 21. The test head 28 is connected to the circuit tester 50 backed up by CPU51. The probe card 30 is attached in the inferior surface of tongue of a test head 28 removable by the holder 29. The probe card 30 has met the wafer 2 on a stage 22.
[0020] The cassette stage 12 and the PURIARAIMENTO stage 15 are established in loading / unloading section 11. The cassette stage 12 is supported by the elevator style 13 controlled by CPU51. The wafer cassette 14 is laid in the stage 12. 25 semi-conductor wafers 2 are held in the cassette 14. The conveyance arm which is not illustrated is prepared in loading / unloading section 11. One semi-conductor wafer 2 is picked out at a time from a cassette 14 by this conveyance arm, and it is conveyed, and is laid on the PURIARAIMENTO stage 15.
[0021] The concrete supply system which is not illustrated is formed in the test section 21. The semi-conductor wafer 2 is transported to the test stage 22 from the PURIARAIMENTO stage 15 by this concrete supply system. The test stage 22 has a vacuum adsorber (not shown) for holding a wafer 2 on the wafer table 5. Moreover, the

test stage 22 builds in the X-Y-Z-theta drive (not shown) for moving the wafer table 5 in each direction of X, Y, Z, and theta. A X-Y-Z-theta drive is controlled by CPU51. Moreover, the joystick 23 is connected to the test stage 22. A joystick 23 is operated by the operator and can control the movement magnitude of a stage 22 by micron order. Moreover, bottom CCD camera 24 is attached in the test stage 22. Bottom CCD camera 24 is for seeing the tip of a contactor 42 used as the criteria of a probe card 30, and detecting the location. In addition, vertical CCD cameras 24 and 25 are connected to the input side of CPU51, respectively.

[0022] As shown in drawing 2 , upper CCD camera 25 and the height sensor 26 are prepared for the proper place of the test section 21. Upper CCD camera 25 and the height sensor 26 are used in order to position the semi-conductor wafer 2 on the test stage 22 to X, Y, Z, and theta shaft orientations. Next, the probe card 30 of the 1st example is explained.

[0023] As shown in drawing 3 and drawing 4 , a probe card 30 attaches a flexible printed circuit (FPC) 34 to a substrate 31. As for the substrate 31 of a probe card 30, nothing and its periphery section are supported by the holder 29 in disc-like. The substrate 31 is built with small metal plates of deformation, such as a stainless steel plate with 5-10mm [in thickness], and a diameter of 200-250mm. Four openings are formed in the substrate 31. Although the center section of FPC34 is located in the substrate 31 bottom, the periphery section of FPC34 is located in the substrate 31 bottom through opening.

[0024] The periphery section of FPC34 is pasted up on the top face of a substrate 31 through the insulation sheet 49. It is prepared in pitch [terminals / 37 / many] spacing at the periphery section of FPC34. Each terminal 37 is electrically connected to 1 to 1 to the contactor 42, respectively. In addition, in illustration, although the terminal 37 is arranged in the periphery section of FPC34 at the single tier, it is good also considering this as two trains or a triplex row.

[0025] The tip of the POGO pin 98 touches each terminal 37, respectively. Each POGO pin 98 is held in the hollow of frame 28a of a test head, and is energized with the compression spring 99. Moreover, each POGO pin 98 is electrically connected to the circuit tester 50 through the test head 28.

[0026] The insulating member 32 has pasted up in the center of an inferior surface of tongue of a substrate 31. Furthermore, FPC34 has pasted the inferior surface of tongue of an insulating member 32. FPC34 is insulated from the substrate 31 by this insulating member 32. Many contactors 42 are formed so that it may project from the inferior surface of tongue of FPC34. An elastic member 33 is embedded to the central field of an insulating member 32, and the attachment field of a contactor 42 is backed up by the elastic member 33. Silicone rubber or polyurethane is used for an elastic member 33.

[0027] As shown in drawing 5 , the contactor 42 is arranged in the shape of a superlattice. The number and array of such a contactor 42 are the same as it of the pad 4 on a semiconductor chip 3. That is, as shown in drawing 6 , a contactor 42 is the terminal for contact of the diameter of several 10 micrometer which supported 1 to 1 to the pad 4, and was formed in the shape of a projection on FPC34. The number of contactors 42 can be increased to the maximum number (for example, 500 pieces) of the terminal of a circuit tester 50.

[0028] Moreover, the contactor 42 is electrically connected to the terminal 37 via the plated printed circuit of FPC34. The terminal 37 touches the POGO pin 98 of a test head 28. Furthermore, FPC34 of the 1st example is explained in detail, referring to drawing 6 - drawing 9 . As shown in drawing 6 , one side (top face) of FPC34 is pasted up on the elastic member 33.

[0029] As shown in drawing 7 , the substrate 35 of FPC34 is built with the polyimide resin film. As shown in drawing 8 , the terminal 37 of patternized a large number is formed in one side (top face) of a substrate 35. The POGO pin 98 touches each terminal 37. on the other hand -- a substrate 35 -- on the other hand (inferior surface of tongue) -- **** -- as shown in drawing 9 , the plated printed circuit 36 is formed. Next, the case where the probing test of the semiconductor chip circuit is carried out by the above-mentioned prober is explained, referring to drawing 10 - drawing 12 R> 2.

[0030] PURIARAIMENTO [one semi-conductor wafer 2 is first picked out from a cassette 14, and / it / this is laid on the PURIARAIMENTO stage 15 and]. As shown in drawing 11 , much chips 3 are formed in the wafer 2. In PURIARAIMENTO, orientation flat 2a of a wafer 2 is arranged with the desired sense. A wafer 2 is conveyed after PURIARAIMENTO and it lays on the test stage 22 (process 101). Consequently, a wafer 2 meets a probe card 30.

[0031] A probing test carries out one wafer 2 in 4 steps. That is, it tests in order of the upper left field shown all over drawing of drawing 11 , an upper right field, a lower left field, and a lower right field. 64 semiconductor chips 3 are formed in each field, respectively. Moreover, what is located in an upper left corner is chosen as criteria pad 4a from from among the pads formed in the chips 3a, 3b, 3c, and 3d at the upper left of each field.

[0032] A stage 22 is moved in XY side and alignment of the optical axis of bottom CCD camera 24 is carried out at the tip of the criteria contactor 42 (process 102). CPU51 is made to memorize the location at the tip of the criteria contactor 42 (teaching). Here, what is located in drawing 5 at an upper left corner is said in the criteria contactor 42.
[0033] A stage 22 is moved in XY side and alignment of the criteria pad 4 of 1st chip 3a is carried out to the optical axis of upper CCD camera 25 (process 103). A stage 22 is moved in XY side and alignment of the criteria pad of the 22nd chip 3 is carried out to the optical axis of upper CCD camera 25 (process 104). When the location has shifted [the wafer 2] to the probe card 30 through these two alignment actuation, theta rotation of a stage 22 is done in XY side, and the location of a wafer 2 is amended to a probe card 30.
[0034] Alignment of the criteria pad 4 of 1st chip 3a is carried out to the criteria contactor 42 (process 105). In this case, both alignment may be finely tuned using a joy stick 23. The test stage 22 is raised after alignment and each pad 4 is contacted to a contactor 42. At this time, the overdrive of the rise stroke of the test stage 22 is carried out across a simple contact location (only location where a pad/contactor only contacts). Since the silicone rubber and the elastic member 33 of a contactor 42 carry out elastic deformation, contact between a pad / contactor both becomes certain over the whole region of a test field.
[0035] The probing test of delivery and 64 semiconductor chips 3 is performed for a test signal from a circuit tester 50 to each contactor 42 (process 106). About a wafer 2, it judges whether all tests were completed (process 107). When the judgment of a process 107 is a no, only an index amount moves the test stage 22 and a probe card 30 is made to meet the upper right field of a wafer 2 (process 108). And actuation from a process 103 to a process 107 is repeated, and the chip 3 in the upper right field of a wafer 2 is tested. Furthermore, the same actuation is repeated twice and the chip 3 in the lower left field and lower right field of a wafer 2 is tested.
[0036] If the judgment of a process 107 becomes yes, a wafer 2 will be taken out from the test stage 22 (process 109). And it judges whether the following wafer 2 is tested (process 110). When the judgment of a process 110 is yes, the new wafer 2 is laid on the test stage 22 (process 111). Subsequently, from the process 103 to the process 108 is repeated. A test is ended when the judgment of a process 110 is a no.
[0037] When having used the probe card 30 of the 1st example of the above and the wafer 2 with which no less than 256 LSI chips 3 were formed was tested, for 256 seconds was able to shorten the test duration conventionally.
[0038] Moreover, although there are many contact point sizes between pad 4 / contactor 42, a contactor 42 can fit all the pads 4 and can tell a test signal certainly to an LSI circuit. Since an elastic member 33 and the elastic body sheet 41 deform even if it is the case where irregularity exists between pad 4 especially, a contactor 42 certainly fits a pad 4. Furthermore, according to the contactor 42, large current capacity can be obtained by low flow resistance, and contact also with a minute positive electrode surface product can be acquired.
[0039] Moreover, since from the contactor 42 to the terminal 37 is made into the circuit of the coaxial pattern of low impedance, a frequency can respond to a RF test 100MHz or more correctly.
[0040] Moreover, since the flatness of the surface of action between a contactor/pad is maintained with a glass substrate 39, both contact is secured to stability. For this reason, it becomes unnecessary to have tested again by the poor contact, and the throughput of LSI manufacture improved. Next, the probe card of the 2nd example is explained with reference to drawing 13 .
[0041] The contact substrate 38 is attached in the surface of action of the probe card of the 2nd example. The contact substrate 38 has a glass substrate 39 and the elastic body sheet 41. A glass substrate 39 is for maintaining the flatness of the contact substrate 38. The elastic body sheet 41 is for making contactor 42a demonstrate flattery nature to a pad 4. Silicone rubber is used for the elastic body sheet 41. In addition, the ingredient which has the flexibility of fluororesin, polyethylene, etc. may be used for the elastic body sheet 41.
[0042] The silicone rubber sheet 41 is formed in one side (inferior surface of tongue) of a glass substrate 39. Contactor 42a lays a corpuscle 43 underground into the projection caudad projected from the silicone rubber sheet 41. For a wire extension, the diameter of 80-100 micrometers and a base is [50-60 micrometers and pitch spacing of the silicone rubber projection of contactor 42a] 90-110 micrometers. Incidentally, 400 bump pads 4 are formed in one semiconductor chip 3. The contact surface of each pad 4 is a square whose one side is 60-100 micrometers.
[0043] The corpuscle 43 is located in a line in the silicone rubber projection of plurality in a single tier. A corpuscle 43 gold-plates at a nickel ball with a diameter of 25-30 micrometers. The corpuscle 43 of the maximum upper case touches the terminal 44 of a glass substrate 39. The corpuscle 43 of the bottom is laid under the point of a silicone rubber projection. If contactor 42a is forced on a pad 4, since the tip of a rubber

projection will be torn and a corpuscle 43 will be exposed, a corpuscle 43 comes to contact electrically to a pad 4. On the contrary, if contactor 42a is separated from a pad 4, since the tip of a rubber projection will close and a corpuscle 43 will hide in inside, a corpuscle 43 does not fall out of rubber. Such a corpuscle 43 can repeat exposure and **** because silicone rubber is gel.

[0044] The manufacture approach of such contactor 42a is explained. Only the need number puts the corpuscle 43 into the hollow of mold, a liquefied silicone rubber raw material is slushed into mold, and this is set in a field. If it carries out like this, the corpuscle 43 in a hollow will be located in a line in a straight line by magnetism. If silicone rubber is made to solidify, the silicone rubber sheet 41 which has much contactor 42a will be obtained. This silicone rubber sheet 41 is pasted up on one side of a glass substrate 39 with adhesives.

[0045] Many terminals 44 are formed in one side (inferior surface of tongue) of a glass substrate 39. on the other hand -- a glass substrate 39 -- on the other hand (top face) -- **** -- the conductor pattern circuit 40 is formed. The conductor pattern circuit 40 is used as the coaxial pattern for adjustment of an impedance. A terminal 44 and the conductor pattern circuit 40 carry out copper foil plating at a glass substrate 39.

[0046] In addition, as shown in drawing 13 , printed circuit 36of FPC34a a is electrically connected to the conductor pattern circuit 40 of a glass substrate 39. Moreover, much terminal 37a flows electrically in printed circuit 36a, and by the spring 99, the POGO pin 98 pushes and is touched by each of terminal 37a. Next, the probe card 60 of the 3rd example is explained.

[0047] As shown in drawing 14 and drawing 15 , a probe card 60 attaches FPC64 to a substrate 61. As for the substrate 61 of a probe card 60, nothing and its periphery section are supported by the holder 29 in disc-like. The substrate 61 is built with the polyimide resin plate with 4.2mm [in thickness], and a diameter of 20mm.

[0048] The periphery section of FPC64 is pasted up on the inferior surface of tongue of a substrate 61. Furthermore, the periphery section of FPC64 is being fixed to the substrate 61 by the pin 68. It is prepared in pitch [terminals / 67 / many] spacing at the periphery section of FPC64. The terminal 67 and the printed circuit 66 are electrically connected by the pin 68. Each terminal 67 is electrically connected to 1 to 1 to the contactor 72, respectively. In addition, in illustration, although the terminal 67 is arranged in the periphery section of FPC64 at the single tier, it is good also considering this as two trains or a triplex row.

[0049] The tip of the POGO pin 98 touches each terminal 67, respectively. Each POGO pin 98 is held in the hollow of frame 28a of a test head, and is energized with the compression spring 99. Moreover, each POGO pin 98 is electrically connected to the circuit tester 50 through the test head 28.

[0050] The insulating member 62 has pasted up in the center of an inferior surface of tongue of a substrate 61. Furthermore, the contact substrate 76 has pasted the inferior surface of tongue of an insulating member 62. Many contactors 72 are formed so that it may project from the inferior surface of tongue of the contact substrate 76. An elastic member 63 is embedded to the central field of an insulating member 62, and the attachment field of a contactor 72 is backed up by the elastic member 63. Silicone rubber or polyurethane is used for an elastic member 63.

[0051] As shown in drawing 16 , the contactor 72 is arranged in the shape of a superlattice. The number and array of such a contactor 72 are the same as it of the pad 4 on a semiconductor chip 3. That is, the contactor 72 supports 1 to 1 to a pad 4. Furthermore, with reference to drawing 17 , the contact substrate 76 is explained in detail.

[0052] The contact substrate 76 pastes up the elastic body sheet 71 on FPC64, and is built. The same thing is substantially used for FPC64 with FPC34 shown in drawing 7 - drawing 9 . The elastic body sheet 71 is for making a contactor 72 demonstrate flattery nature to a pad 4. Silicone rubber is used for the elastic body sheet 71. In addition, the ingredient which has the flexibility of fluororesin, polyethylene, etc. may be used for the elastic body sheet 71.

[0053] The silicone rubber sheet 71 is formed in one side (inferior surface of tongue) of FPC64. A contactor 72 lays a corpuscle 73 underground into the projection caudad projected from the silicone rubber sheet 71. For a wire extension, the diameter of 80-100 micrometers and a base is [50-60 micrometers and pitch spacing of the silicone rubber projection of a contactor 72] 90-110 micrometers.

[0054] The corpuscle 73 is located in a line in the silicone rubber projection of plurality in a single tier. A corpuscle 73 gold-plates at a nickel ball with a diameter of 25-30 micrometers. The corpuscle 73 of the maximum upper case touches the printed circuit 66 of FPC64. The corpuscle 73 of the bottom is laid under the point of a silicone rubber projection. If a contactor 72 is forced on a pad 4, since the tip of a rubber projection will be torn and a corpuscle 73 will be exposed, a corpuscle 73 comes to contact electrically to a pad 4. On the contrary, if a contactor 72 is separated from a pad 4, since the tip of a rubber projection will close and a

corpuscle 73 will hide in inside, a corpuscle 73 does not fall out of rubber. Such a corpuscle 73 can repeat exposure and **** because silicone rubber is gel.
[0055] When having used the probe card 60 of the 3rd example of the above and the wafer 2 with which no less than 256 LSI chips 3 were formed was tested, for 256 seconds was able to shorten the test duration conventionally.
[0056] Moreover, since an elastic member 63 and the elastic body sheet 71 deform even if it is the case where irregularity exists between pad 4, a contactor 72 certainly comes to fit a pad 4. A positive test can be performed even if it is LSI chip 3 in which the pad 4 of high density was formed by this.
[0057] Next, the 4th example is explained, referring to drawing 19 -21. The probe card 80 of this 4th example is used in order to carry out the probing test of the liquid crystal display substrate (LCD substrate). This example explains the case where four LCD substrates are inspected to coincidence.
[0058] As shown in drawing 19 and drawing 20 , the probe card 80 has the insulating substrate 81, the flexible substrate 84, the transparence plate 95, and the elastic member 83. The insulating substrate 81 is built with the ingredient excellent in the thermal resistance and dimensional stability of polyimide etc. If a holder (not shown) is equipped with a probe card 80, the POGO pin 98 will contact the terminal pad 97, and the contactor 92 of a probe card 80 will be electrically connected to a circuit tester 50.
[0059] The flexible substrate 84 is built considering the film with the flexibility which consists of insulating ingredients, such as silicone rubber, as a base material, and the conductive contactor 92 is formed in the one side. The contactor 92 is arranged so that it may correspond to the pad of a LCD substrate 1 to 1. Moreover, as for the contactor 92, the terminal pad 97 and the same number are prepared. A contactor 92 can prepare 500 pieces to the maximum of the terminal of a circuit tester 50, for example.
[0060] As shown in drawing 21 , a contactor 92 is a 1 **** poor thing at least about metal particles 93 in the thickness direction of the silicone rubber sheet 94. According to such a contactor 92, large current capacity can be obtained by low flow resistance, and contact also with a minute positive electrode surface product can be acquired. The metal particles 93 of the maximum upper case touch the electric conduction pattern 86 of FPC84. The metal particles 93 of the bottom should be contacted by the pad of a LCD substrate.
[0061] The transparence plate 95 is a member for fixing the flexible substrate 84, and is built with ingredients, such as a glass plate. The transparence plate 95 is being fixed to one side (top face) of the flexible substrate 84 by the holddown member 90. The transparence plate 95 is for maintaining the display flatness of the flexible substrate 84. In addition, the alignment mark 91 is attached to the top face of the transparence plate 95.
[0062] An elastic member 83 consists of a sheet of five sheets made from polyurethane, and is inserted between the insulating substrate 82 and the flexible substrate 84. The insulating substrate 82 is attached in the inferior surface of tongue of the main substrate 81 on four screws 87. An insulating substrate 82 and the main substrate 81 are assembled with a sufficient precision with a gage pin 88. The insulating substrate 82 is built with the ingredient with sufficient dimensional stability, and high display flatness is made to the field.
[0063] The periphery section of the flexible substrate 84 is being fixed to the insulating substrate 81 by the ring-like holddown member 79. The electric conduction pattern 86 of FPC84 is electrically connected to the terminal pad 97 by this.
[0064] As shown in drawing 19 and drawing 20 , four openings window part 81a is formed in the proper place of the main substrate 81. It lets such opening window part 81a pass, and with upper CCD camera 25, the alignment mark 91 is recognized and alignment of the pad and contactor 92 of a LCD substrate is carried out. Next, actuation of the 4th example is explained.
[0065] A LCD substrate is conveyed from the cassette of the sender of LCD substrate test equipment, and this is laid on a test stage. Here, in order to inspect four LCD substrates at once, a LCD substrate is laid on a test stage one after another. Looking at the alignment mark 91 from window part 81a of a probe card 80, a test stage is moved horizontally and alignment of the LCD substrate is carried out to a probe card 80. Subsequently, a test stage is raised and the pad of a LCD substrate is contacted to a contactor 92. At this time, a contactor 92 follows the irregularity of the pad of a LCD substrate, and contacts certainly. Moreover, since installation of a probe card 80 is inaccurate, though the probe card 80 leans to the horizontal plane, the inclination is corrected according to deformation of an elastic member 83, and all the contactors 92 can be certainly contacted to the pad of a LCD substrate. By the circuit tester, a contactor 92 is operated alternatively and a voltage signal (test signal) is impressed to the pad of a LCD substrate. A LCD substrate [finishing / inspection] is conveyed to a receiver, and inspection is ended.
[0066] According to the 4th above-mentioned example, since the insulating substrate 81 of a probe card 80 is

located during a test right above [of a LCD substrate], there is no possibility that a contaminant and particle may fall on a LCD substrate, and a clean condition can be maintained.
[0067] Moreover, according to the 4th above-mentioned example, the whole one LCD substrate surface or two or more LCD substrates can be inspected by this first alignment that what is necessary is to carry out alignment of the LCD substrate only once to a probe card 80.
[0068] Moreover, since the insulating substrate 81 was equipped with FPC84 by the holddown member 79, when a probe card 80 needs to be exchanged by damage on a contactor 92, wear, etc., it is not necessary to exchange the whole probe card. In this case, what is necessary is just to exchange from the flexible substrate 84 to the insulating substrate 81 as one. Moreover, the flexible substrate 84 can always be attached with a sufficient precision by the location texture pin 87 also at the time of probe card exchange.
[0069]
[Effect of the Invention] If the probe card of this invention is used, the probing test of the LCD substrate can be carried out certainly at a VLSI chip, ULSI chip, and compound chip-ized gate array and a list. For this reason, the incidence rate of Retest can be reduced sharply.
[0070] Moreover, since according to the probe card of this invention alignment actuation with a contactor and a pad can be easy, and can reach far and wide and a package can be contacted to many pads, VLSI and large-sized LCD can be tested in a short time.
[0071] Furthermore, the probe card of this invention is easy to manufacture in comparison, and low cost. Moreover, since it is not necessary to polish the needle point like before, maintenance check also becomes easy.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block block diagram showing the whole prober configuration.
[Drawing 2] The easy flat-surface layout pattern of a prober.
[Drawing 3] Drawing of longitudinal section showing the probe card concerning the 1st example of this invention.
[Drawing 4] The top view which looked at the probe card of the 1st example from the upper part.
[Drawing 5] The part plan which looked at the contactor attachment section prepared in the center of the probe card of the 1st example from the lower part.
[Drawing 6] Drawing of longitudinal section expanding and showing some probe cards of the 1st example.
[Drawing 7] Drawing of longitudinal section of FPC (Flexible Printed Circuit).
[Drawing 8] Drawing showing the top-face pattern (connection side with the POGO pin of a circuit tester) of FPC.
[Drawing 9] Drawing showing the inferior-surface-of-tongue pattern of FPC.
[Drawing 10] The flow chart which shows the activation procedure of a probing test.
[Drawing 11] Drawing showing the pattern formation side of a semi-conductor wafer.
[Drawing 12] The enlarged drawing expanding and showing one semiconductor chip.
[Drawing 13] Drawing of longitudinal section expanding and showing some probe cards of the 2nd example.
[Drawing 14] Drawing of longitudinal section showing the probe card of the 3rd example.
[Drawing 15] The top view which looked at the probe card of the 3rd example from the upper part.

[Drawing 16] The part plan which looked at the contactor attachment section prepared in the center of the probe card of the 3rd example from the lower part.
[Drawing 17] Drawing of longitudinal section expanding and showing the contactor attachment section of the probe card of the 3rd example.
[Drawing 18] Drawing of longitudinal section showing the probe card of the 4th example.
[Drawing 19] The top view which looked at the probe card of the 4th example from the upper part.
[Drawing 20] Drawing of longitudinal section expanding and showing the contactor attachment section of the probe card of the 4th example.
[Drawing 21] The perspective view showing the outline of the conventional probe card.
[Drawing 22] The partial enlarged drawing showing the contact part of the conventional probe needle and a pad typically.
[Drawing 23] It is the expansion top view showing typically the relation between the conventional probe needle and a pad.
[Description of Notations]
31, 61, 81 [— A contactor, 34, 64, 84 / — FPC 37, 67, 97 / — A terminal, 39 / — A glass substrate, 41, 71, 94 / — An elastic body sheet 43, 73, 93 / — A corpuscle, 98 / — POGO pin] — 32 A support plate, 62 — An insulating member, 33, 63, 83 — An elastic member, 42, 42a, 72, 92

[Translation done.]

* NOTICES *

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damages caused by the use of this translation.

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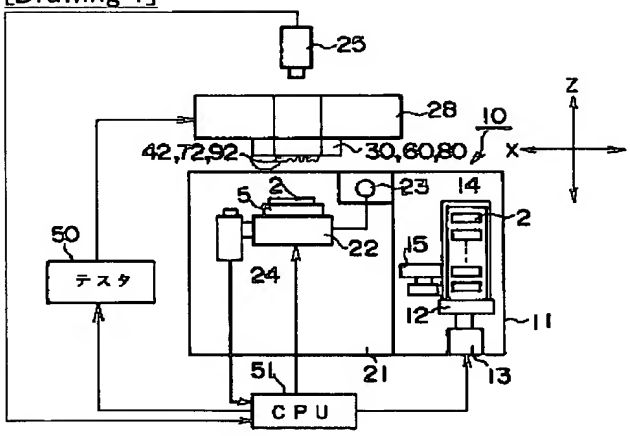
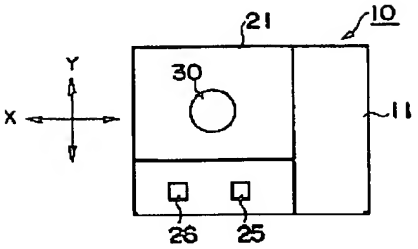
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

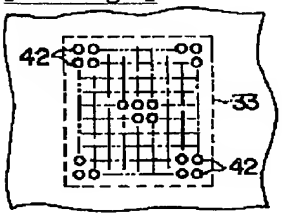
[Drawing 1]



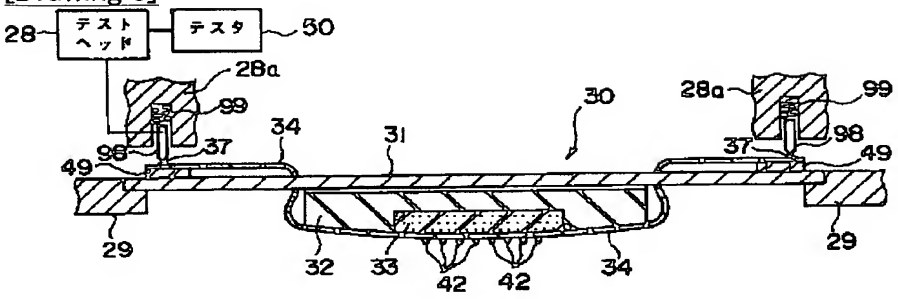
[Drawing 2]



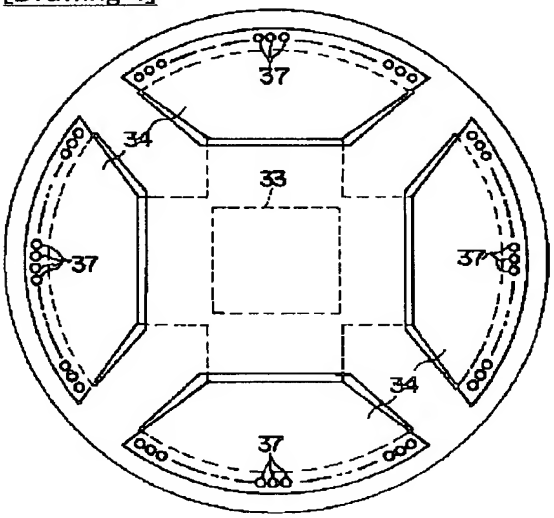
[Drawing 5]



[Drawing 3]



[Drawing 4]



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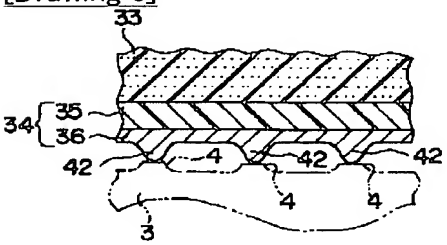

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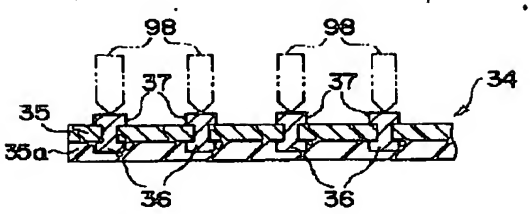
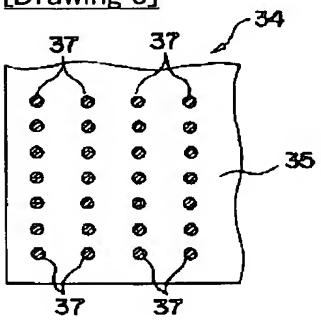
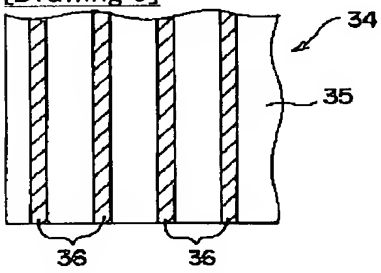


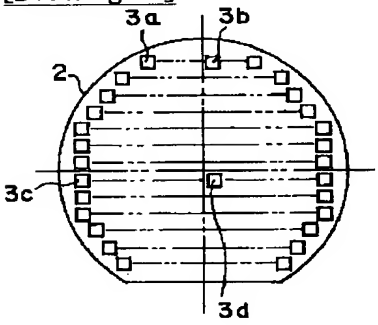
[Drawing 8]



[Drawing 9]



[Drawing 11]



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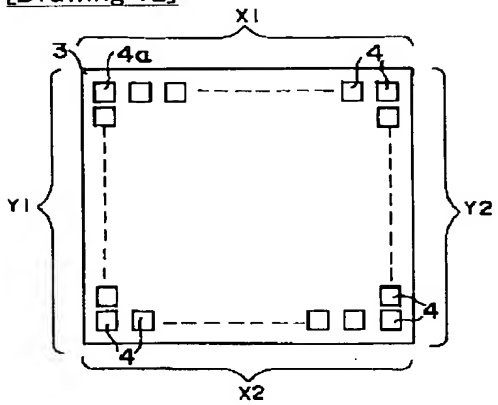
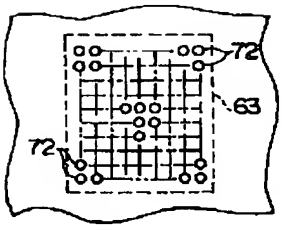


[Drawing 16]



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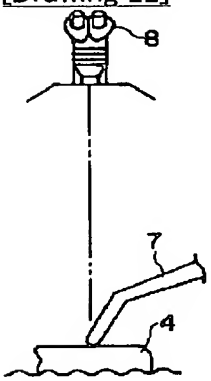
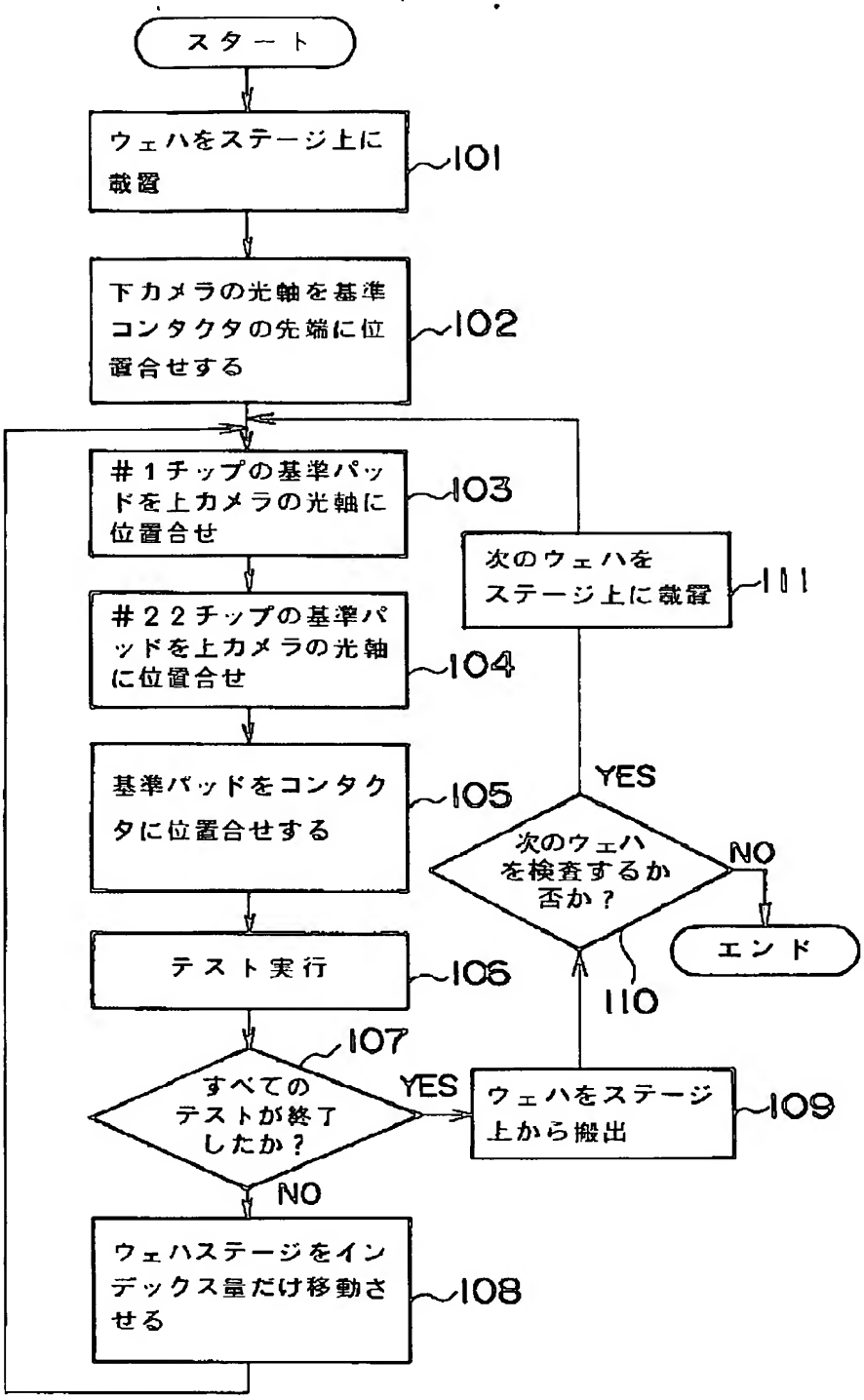
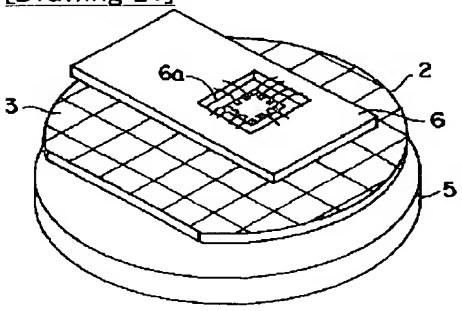


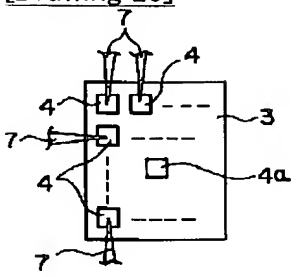
[Drawing 10]


スタート
ウェハをステージ上に載置
101
下カメラの光軸を基準コンタクタの先端に位置合せする
102
＃１チップの基準パッドを上カメラの光軸に位置合せ
103
＃２２チップの基準パッドを上カメラの光軸に位置合せ
104
基準パッドをコンタクタに位置合せする
105
テスト実行
106
すべてのテストが終了したか？
107
YES
NO
ウェハステージをインデックス量だけ移動させる
108
ウェハをステージ上から搬出
109
次のウェハを検査するか否か？
110
YES
NO
エンド
次のウェハをステージ上に載置
111

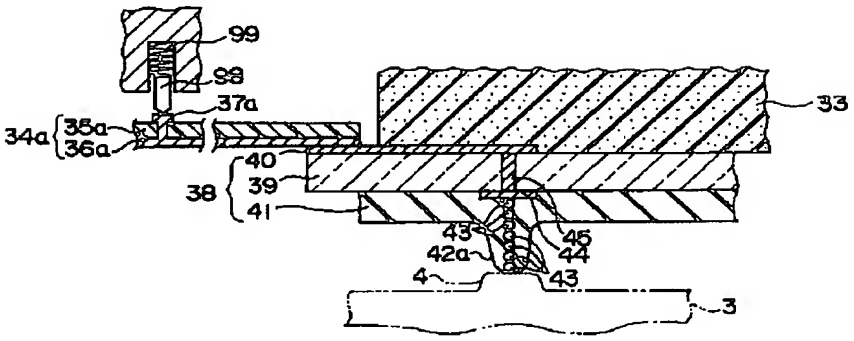
[Drawing 21]


6a
2
3
6
5

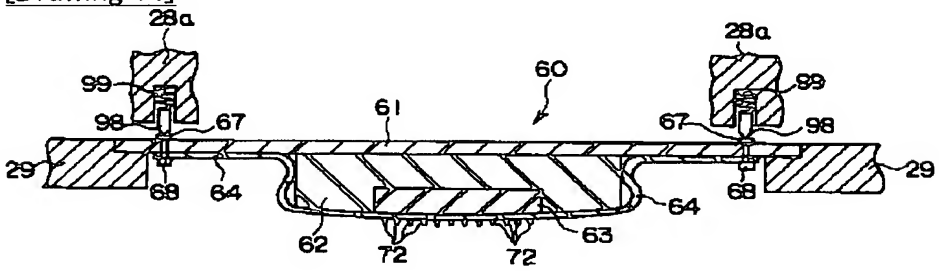
[Drawing 23]



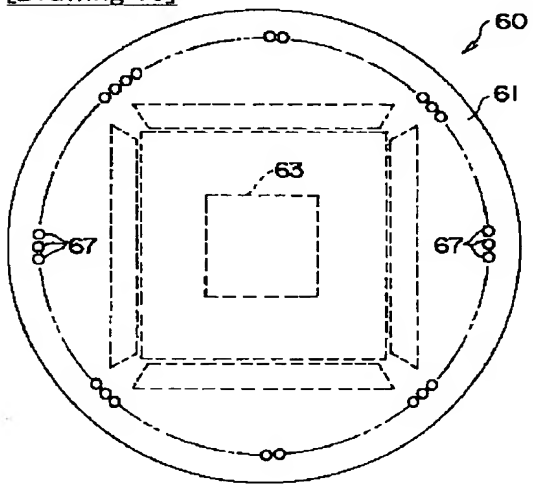
[Drawing 13]



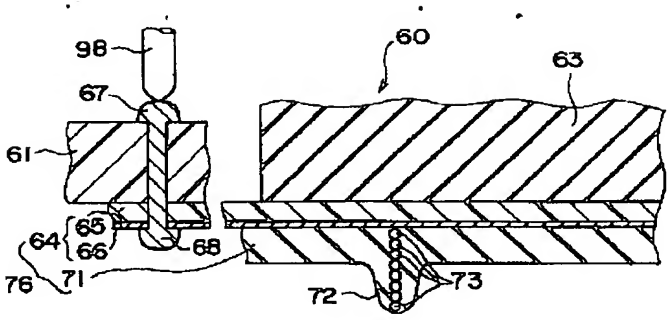
[Drawing 14]



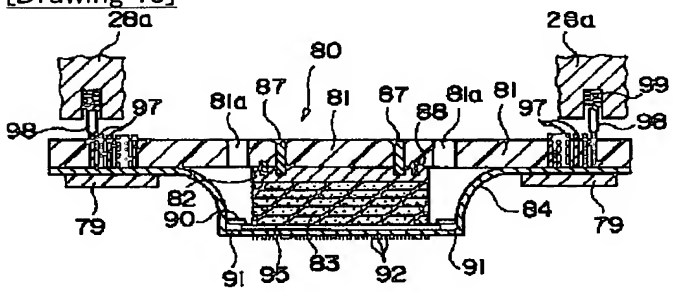
[Drawing 15]



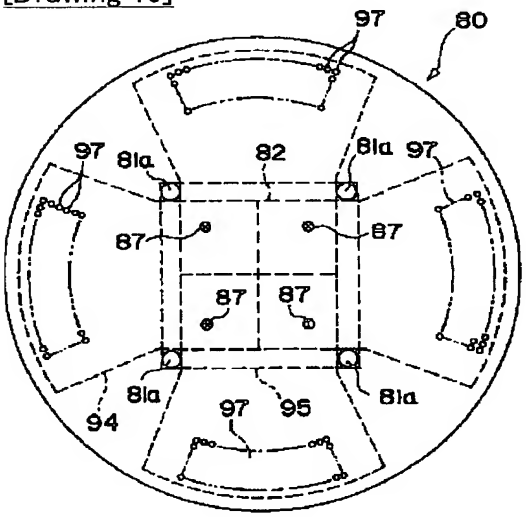
[Drawing 17]



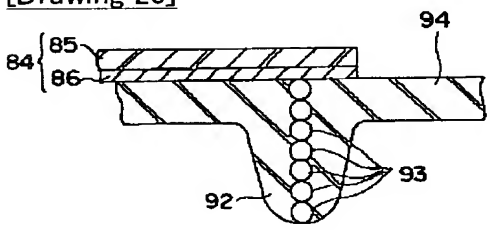
[Drawing 18]



[Drawing 19]



[Drawing 20]



[Translation done.]